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The SHIELDS project: Space Hazards Induced near Earth by Large, Dynamic Storms

Institutional Computing Report

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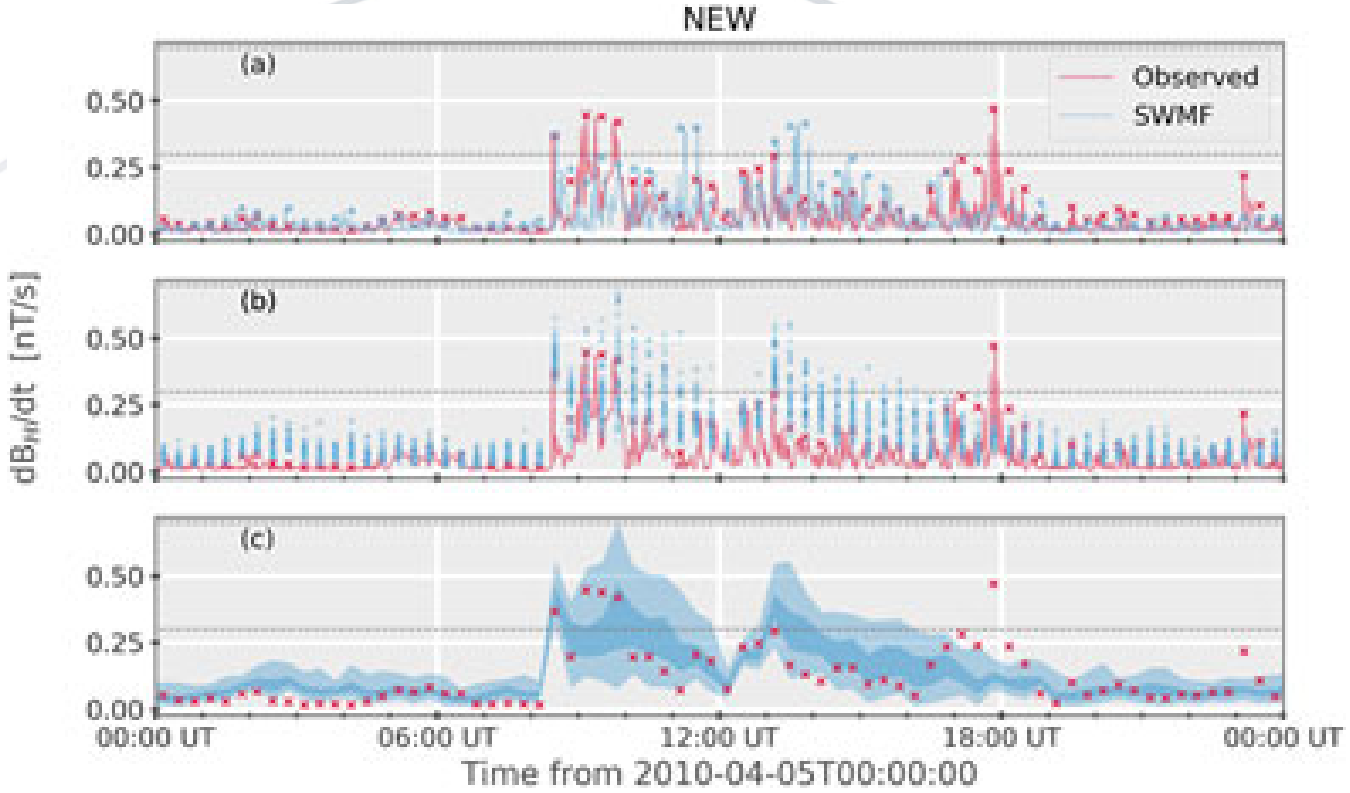
NNSA
National Nuclear Security Administration

Space Hazards Induced near Earth by Large, Dynamic Storms (SHIELDS)

- The main objective of the LDRD-DR SHIELDS project was to develop a new capability to understand, model, and predict the spacecraft Surface Charging Environment (SCE)
- Institutional Computing resources have been used to:
  - Simulate particle injections using data assimilation in the kinetic Ring current–Atmosphere interactions Model with a 3-D Self-Consistent magnetic (B) field (RAM-SCB)
  - Perform high-fidelity simulations with the BATS-R-US magneto-hydrodynamic code coupled with RAM-SCB for particle tracing studies
  - Proof-of-concept perturbed input ensemble modeling for uncertainty quantification in coupled space physics models

Simulation Results



- **Demonstration of the utility of perturbed input ensemble modeling by running a set of large-scale simulations of the magnetosphere using the SWMF**
- **Horizontal geomagnetic perturbations at the Newport (NEW) magnetic observatory (a) reference simulation, 20-minute maxima are marked by symbols; (b) ensemble results; (c) derived 50% and 95% confidence intervals on the prediction shown by the blue bands.**